

hidden away in the thick rank undergrowth. The nest is a loosely constructed ball of dead leaves, lined inwardly with fine roots, and the entrance is often somewhat hidden with fresh green moss stuck in the nest. The eggs are three, and glossy white. The nest was taken on the 17th January. Axis 0·8, diam. 6·6.

The native name is "Konkut Landak" (porcupine). Konkut is the native name of all Timeliine birds; the name "landak" is applicable to the long white-stemmed feathers which stream from the sides and back.

Bill and feet black; skin round the eye and bare space on the sides of the neck dark French blue. These bare spaces are also found on the neck of *Stachyris maculata*, which has also long feathers on the back; so perhaps these genera are only slightly removed.]

118. ALCIPPE CINEREA.

Alcippe cinerea, Blyth; Sharpe, Cat. B. vii. p. 622.

a, b. ♂ ad. Benkoka, Sept. 16, 1885.

c. ♂ ad. Benkoka, Nov. 1, 1885.

d. ♀ ad. Kina Balu, May, 8, 1888.

[Found on Kina Balu up to 2000 feet.]

[To be continued.]

XXVI.—*Contributions to the Anatomy of the Hoatzin* (*Opisthocomus cristatus*), with particular Reference to the Structure of the Wing in the Young. By FRANK E. BEDDARD, M.A., F.Z.S., Prosector to the Zoological Society of London, Lecturer on Biology in the Medical School of Guy's Hospital.

SOMETIME since Mr. Selater obtained from the Royal Society a grant of money for the purpose of acquiring specimens of the young of the Hoatzin; for some remarkable statements concerning the development of this bird, lately published in America, as well as the general interest attaching to this very isolated type, seemed to render a renewed study of its structure desirable. Mr. Quelch, the Superintendent of the

Georgetown Museum, Demerara, kindly interested himself in the matter, and forwarded in strong spirit a large number of eggs, nestlings, and adult birds, which arrived in England a few months ago*. Mr. Selater, with great generosity, handed over to me the whole of the material, requesting me to furnish him with a report thereon. Some of the results of my study are embodied in the present paper.

The collection contained 9 adult birds, 12 chicks of various ages, and 28 eggs. A few of the latter were added, but

Fig. 1.

*Opisthocomus cristatus.*

Young extracted from the egg: to show position in egg, continuous down-feathers, and the knob on the bill which serves to break the shell†.

from the greater number I was able to extract chicks, all of which were in an advanced stage of development, for the most part ready to leave the egg.

A paper upon the anatomy of *Opisthocomus*, which forms the most recent contribution to our knowledge of the structure of this bird, has been lately published by Dr. C. G. Young‡. This paper contains some new facts of interest with regard to the structure of the wing, which will be referred to in detail presently; the account of the habits of the bird is not without interest, but the general description of its anatomy cannot be regarded as of any value. In the first place there is absolutely not a single reference to the litera-

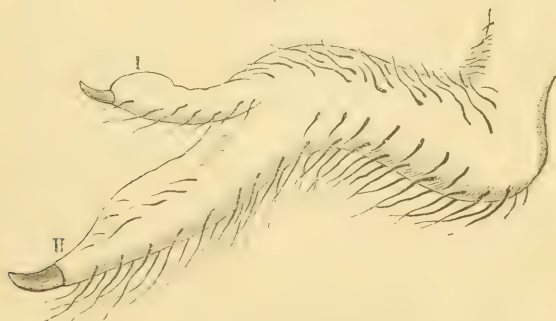
* See P.Z.S. 1889, p. 57.

† It is important to note whether this structure is present or absent; although usually present, Prof. T. J. Parker finds that it is not developed in *Apteryx* (Proc. Roy. Soc. vol. xliii. p. 497).

‡ "On the Habits and Anatomy of *Opisthocomus cristatus*, Illig.," Notes from the Leyden Museum, vol. x. p. 169.

ture of the subject, and the work of previous writers appears to be entirely ignored; nor can this omission be excused on the ground that Dr. Young's description is so complete as to render useless any reference to older writers. The syrinx, which has been well figured (in two aspects) and described by Prof. Garrod*, is represented by a small† and very inaccurate drawing. The only description of the windpipe is as follows (p. 172):—"The windpipe, after it enters the chest, gives off on each side one small branch, and passing on terminates into (*sic*) two tubes." Apart from the error contained in the first sentence (the "branches" are presumably the sterno-tracheal muscles, but are represented in the plates as if they were actually branches of the trachea itself!), it seems a waste of space to state that the trachea divides into two bronchi; for this fact is not of any interest as a contribution to the structure of the genus.

Fig. 2.

*Opisthocomus cristatus.*

Left Manus of Chick from outside: I, pollex; II, index.

Wing of young Opisthocomus.

The external characters of the wing of the young bird are illustrated in figs. 1 and 2 of the plate which accompanies Dr. Young's paper, and in woodcut, fig. 2, of the present article. The most remarkable point in the structure of this

* "Notes on Points in the Anatomy of the Hoatzin (*Opisthocomus cristatus*)," P. Z. S. 1879, p. 109, and Coll. Papers, p. 465.

† *Loc. cit.* pl. viii. fig. 6.

organ is the presence of a well-developed curved nail upon both the *pollex* and the *index*. In the large number of specimens which I have examined the relative positions of these two digits differ very considerably; sometimes they are parallel to each other, in other specimens opposed, and there are various gradations between these two extremes. The condition of the specimens quite bears out Dr. Young's statement that "both the thumb and [first] finger have the power of ab- and ad-duction;" and it is not surprising to learn that the young birds make use of their wings in scrambling about, and dig their claws into the ground.

It is highly interesting to find that the possession of these claws on the thumb and first finger, which is an archaic character found in but few birds*, is of *functional* importance in the young Hoatzin. The claws in the adult are, as Dr. Young correctly states, reduced to mere wart-like tubercles.

The first reference to the external characters of the wing in the young *Opisthocomus* is contained in a communication addressed to the Chicago Academy of Sciences by Mr. Edward M. Brigham, some selections from which have been printed in this Journal †, and I have been able, through the kindness of Mr. Selater, to read an article upon the same subject published in the 'Chicago Tribune' of Oct. 1884. There is not, however, any exact description of the wing, but the presence of claws is noted.

Pterylosis.

After a careful study of the pterylosis of the adult bird, as well as of the nestlings and unhatched young, I find myself unable to agree with Nitzsch's description ‡ and illustrations § of the pterylosis of *Opisthocomus*.

* The most recent paper on this subject is by Prof. Parker "On the Development of the Wing in the Common Fowl," Phil. Trans. 1888. The principal types are there mentioned in which there are one, two, or three claws.

† Ibis, 1885, p. 118.

‡ 'Pterylography,' Engl. ed., by Selater, p. 108.

§ *Ibid.* pl. vii. figs. 12, 13.

In the first place the line in Nitzsch's figure indicating the position of the carina sterni is misleading, as it does not show where the carina sterni really is ; the point is better illustrated in Mr. J. Beswick Perrin's account of the myology of *Opisthocomus**. Mr. Perrin does not, in this paper, enter into any description of the pterylosis, but repeats Nitzsch's figures†, with the remark that in his specimens "the pterylography . . . was almost identical with that figured in Nitzsch's work." The word "almost," in a question relating to pterylography, allows a considerable latitude for variation ; the differences in arrangement in the feather-tracts being often very inconspicuous, although very constant and therefore of importance.

In the adult bird the pterylosis of the head and neck is, as Nitzsch has correctly stated, continuous ; on the ventral side the two ventral tracts do not divide so early as is represented in Nitzsch's diagram ; the ventral surface is covered with a continuous feather-tract as far down as about halfway between the fore and hind limbs ; after this there is a median bare space of some extent, which is, however, sparsely feathered ; the median *apterion* does not, in fact, commence until the carina sterni, and is here exceedingly narrow, its width being precisely that of the carina ; the apterion is sharply marked here by a straight row of feathers on each side ; from this point the *apterion* is conspicuous and of some breadth, and the two ventral tracts become narrow, though connected by scattered feathering with the femoral tracts.

The lateral ventral tracts unite with one another some way in front of the cloacal aperture.

The spinal tracts do not show quite so regular an apterion as in Nitzsch's figures ; indeed, the dorsal surface is sparsely feathered all over, with stronger feathers here and there, particularly anteriorly, where they form a strong band, as figured by Nitzsch.

The humeral tracts are conspicuous, as figured by Nitzsch.

* "On the Myology of *Opisthocomus cristatus*," Trans. Zool. Soc. vol. ix. p. 353, pl. lxiii. fig. 3, *tb*.

† *Loc. cit.* pl. lxiii. figs. 1, 2.

The above notes upon the pterylosis of *Opisthocomus cristatus* were written before I had read what Prof. Garrod had said upon the subject in his article upon the anatomy of the bird*. It is important to notice that in the three specimens dissected the characters of the ventral pterylosis were much the same as in my specimen; there is therefore no room for doubt that the description and figures of Nitzsch are not perfectly correct.

Prof. Garrod, as well as Dr. Young and Mr. Brigham, remarks upon a patch of thickened integument which covers the surface of the carina sterni. The observations upon the habits of the bird made by Dr. Young, Mr. Brigham, and Mr. Quelch show that this callosity is probably due to the fact that the bird flies but little, although it possesses long and strong wings, but remains at rest, with the breast touching the branch of the tree. It might be suggested that this would also largely account for the bare spaces in front of and behind the carina sterni. If this be so the ventral *apterion* would not correspond to that of many other birds, but would be simply due to mechanical causes acting in the lifetime of the bird. Thus the feathering would be nearly continuous, a condition which there is some reason for regarding as a primitive one. Prof. Garrod has seemingly appreciated this main characteristic of the pterylosis, as the following quotation will show (Coll. Papers, p. 465):—" *Opisthocomus* is one of those birds in which the pterylosis is not so decisive of its affinities as in many cases, the reason being that so great an amount of the unfeathered spaces is protected by semiplumes. May not these semiplumes in many instances be degenerated feathers? This question has never been decided, so far as I am aware."

So much for the pterylosis of the adult bird.

In the nestling the condition is much the same, but the down-feathers are more numerous.

The feathering of the young chick was examined with great care, in order, if possible, to throw some light upon the question of the apparent continuity of the feathering. I find that the ventral *apterion* is as conspicuously developed as in

* *Loc. cit.* p. 110 (Coll. Papers, p. 465).

the adult bird, hence the effect of wear during the lifetime is obviously not sufficient to account for its presence. On the dorsal surface the feathering appeared to be quite uniform,

Fig. 3.

*Opisthocomus cristatus.*

Young Chick, showing dorsal and ventral feather-tracts : *y*, yolk-sac.

though sparse ; there was no distinct spinal apterion to be made out ; in these young chicks the ventral feathering was much closer than the dorsal.

Now the continuous feathering of the adult in the Ostrich* and Apteryx† is not met with in the chick, which shows in both cases distinct apteria ; this fact is further evidence in favour of regarding the flightless Struthious birds as the immediate descendants of birds with wings developed for flying. Nitzsch‡ explains the presence of apteria as an assistance to the free movements of the limbs, which would be hampered by a dense and uninterrupted plumage, and also considers them to be partly due to the large size of the contour-feathers. It seems likely, however, that in the primitive bird the feathering was uniform and probably of a downy character ;

* Miss B. Lindsay, "On the Avian Sternum," P. Z. S. 1885, p. 684, pl. xliii. figs. 6, 7.

† T. J. Parker, "On the Development of *Apteryx*," Proc. Roy. Soc. vol. xliii. p. 482.

‡ 'Pterylography,' Engl. ed., p. 17.

this may account for the absence of traces of body-feathering in *Archæopteryx*; the feathering may, in fact, have been very like that of existing Struthious birds; the increase in the power of flight led, on Nitzsch's hypothesis, to the formation of apteria. It seems to me possible that the same freedom of movement of the wings may also have been obtained by a scattered condition of the contour-feathers, while the view of Nitzsch that "the interrupted feather-clothing must be deduced, as a necessity, from the great size of the contour-feathers," is also quite in harmony with this supposition.

The contour-feathers of *Opisthocomus* are furnished with an *aftershaft*.

The remiges are developed as down-feathers in the youngest chicks, and their number corresponds with that of the adult bird (*i. e.*, 19); the tectrices dorsales were also visible in the early stages, when no other feathers, on the wing, except the remiges, were present. There was no evidence in later stages of these embryonic remiges being *replaced* by a subsequently developed series of remiges. These facts confirm, so far, the conclusions of Landois* and Davies†, that the down-feathers do not form a separate embryonic feathering (having a relation to the permanent feathering analogous to that of milk-teeth to permanent dentition), but are merely the free extremities of the contour-feathers. I may remark, however, that these gentlemen have omitted to call attention to the fact that Mr. A. D. Bartlett some 27 years ago showed reasons for making a similar statement ‡. He said (P. Z. S. 1861, p. 370):—"There is a beautiful example of the progressive growth from the first down to the perfect feathers to be seen on the young of this bird [*Grus montignesia*]. I have in many birds observed this, but not to so great an extent. It appears that the first down is not thrown off, but continues to grow longer, until the perfect feather is developed, having the

* "Das Dunennestkleid der Vögel besteht nicht aus Dunen," Zool. Anz. Bd. xi. p. 703.

† "Beitrag zur Entwickl. der Feder," Morph. Jahrb. Bd. iv. p. 369.

‡ "Notes on the Breeding and Rearing of the Chinese Crane (*Grus montignesia*) in the Society's Gardens," P. Z. S. 1861, p. 369.

early down attached to its point; this condition is to be seen not only upon the points of the primaries, but also on the ends of the feathers of the entire plumage." These conclusions seem to be identical with those of Dr. Landois and Mr. Davies; it must be admitted, however, that the title of Mr. Bartlett's paper is a little misleading in this respect, and would hardly suggest that the paper contained the important morphological facts referred to.

Syrinx.—This organ has been described by Johannes Müller*, and more recently, as well as more fully, by

Fig. 4.



Syrinx of *Opisthocomus cristatus*.

a, insertion of syringeal muscle; *b*, fibrous band continuous with syringeal muscle.

* Ber. Akad. Wiss. Berlin, 1841, p. 177.

Garrod*. The incorrect figure of this organ given by Young has been already referred to (p. 285).

The principal features in the structure of the syrinx are illustrated in Garrod's figure; but I find that the box formed by the union of the last tracheal and upper bronchial rings may be composed of more elements than are represented in his fig. 1. There is, in fact, some variation in the adults examined by me in the number of rings which unite to form this box (p. 291); this part of the windpipe is not unlike the corresponding region of *Indicator*†. The syringeal muscles (intrinsic) end, as Garrod shows, upon one of the free tracheal rings immediately preceding the fused rings. In Garrod's figure the muscle is continued into a tissue which is differently shaded, and presumably represents a fibrous band; this is inserted into the following ring. In some specimens examined by me the fibrous continuation of the muscles extends along the windpipe as far as the first or second bronchial ring; the fibrous band is composed of a very tough tissue. It appears to me to be legitimate to compare this with a band of fibroid tissue which occupies the place of the absent syringeal muscles in *Baleniceps*‡, and which I have considered to be the degenerate equivalent of those muscles. In *Opisthocomus* it will be noticed that the fibrous continuations of the syringeal muscles are attached to the bronchial semiring, to which it is most usual in birds to find these muscles attached. It is probable that, as the last tracheal and first bronchial rings become consolidated into the box-like structure of the adult, the atrophy of the muscle commences below the top of the box. The movements of the first bronchial rings could be as easily effected by the attachment of the muscle to the top of the box, and

* Coll. Papers, p. 466.

† Garrod, "Notes on the Anatomy of *Indicator major*," P. Z. S. 1878, p. 935, and Coll. Papers, p. 464, fig. 3.

‡ "On Certain Points in the Structure of *Baleniceps* bearing upon its Affinities," P. Z. S. 1888, p. 284. Prof. Parker ("On the Systematic Position of the Crested Screamer," P. Z. S. 1863, p. 514) has observed that in that bird the intrinsic muscles of the syrinx end in a fan-shaped fascia.

thus the necessity for a prolongation of the muscle further than this point disappears. I have mentioned above that the terminal "box" of the trachea is sometimes composed of a larger number of elements than is allowed by Garrod. This opinion results from the study of a young chick, in which the last tracheal rings are free, and the syrinx (see fig. 4) has altogether a more "typical" structure than that of the adult. The muscle is seen to terminate on *the 8th ring before the first bronchial*. This appears to show that the tracheal box is formed by the fusion of eight tracheal and bronchial rings; the syringeal muscle in the chick is continued into a fibrous band (fig. 1*b*), the relations of which are similar to those of the adult.

XXVII.—*Note on Emberiza cioides, Brandt.*

By H. B. TRISTRAM, D.D., F.R.S.

(Plate X.)

ATTENTION has lately been drawn to the Eastern Palæarctic Bunting, *Emberiza cioides*, Brandt, Bull. Acad. Sci. St. Pétersbourg, p. 363 (1813), by the fact that our Member, Mr. R. W. Chase, of Birmingham, has lately obtained at Flamborough a specimen of this species. This specimen is stated to have been taken there in October 1887, and to have been mounted from the flesh by Matthew Bailey, who did not know the bird, and was quite ignorant of the interest attaching to it. The species has considerable seasonal variation, and this specimen agrees exactly with one in my own collection obtained near Lake Baikal in the month of October. So far, therefore, the evidence of its occurrence at Flamborough seems satisfactory. But it is curious that the bird has never been met with before in Europe, not even in that resort of unwonted stragglers, Heligoland, nor even in Western Siberia.

The confusion in the nomenclature of this Bunting is almost inextricable. First noticed by Pallas, it was by him erroneously identified with *Emberiza cia*, L. It is evident